Section 4.12

Wetlands

This section describes the wetlands and other aquatic resources in the study area. It presents information regarding changes in wetland type and function that have occurred since publication of the Final EIS and provides supplemental information to define and describe more clearly the vegetation types present in the wetland areas in the study area. Specifically, this section

- describes wetland impacts that have occurred to date as a result of initial project construction;
- identifies all direct and indirect impacts of the No-Build and build alternatives on wetlands in the study area;
- describes wetland succession, both in general and in the context of Great Salt Lake flooding;
- discusses the role of flooding on the temporal variation in wetland functions;
- quantifies direct and indirect impacts in terms of acres affected;
- characterizes direct and indirect impacts in terms of wetland functions;
- discloses cumulative effects on wetland resources; and
- updates the status of proposed wetland mitigation and the Legacy Nature Preserve.

Appendix D, *Wetlands Functional Assessment*, provides detailed technical data to supplement the information presented in this section. Appendix E, *Analysis of the Adequacy of Wetlands and Wildlife Mitigation*, provides a detailed analysis of the effectiveness of the proposed mitigation to replace wetland and wildlife functions that would be lost or reduced from direct and indirect impacts of implementation of Legacy Parkway. Appendix E provides an accounting of impacts relative to mitigation in a variety of formats including functional capacity units, vegetation cover type, and wildlife habitat. Appendix F provides a wetlands mitigation and monitoring plan for activities performed on the Legacy Nature Preserve.

4.12.1 Approach and Methodology

4.12.1.1 Changes since June 2000 Final EIS

This section presents updated and supplemental information on wetland resources in the study area. The study area for the wetlands analysis has changed since publication of the June 2000 Final EIS. The revised study area (Figure 4.12-1) includes wetland resources north of the I-215/I-5 interchange (i.e., it previously extended south to I-80 and west past the Salt Lake City International Airport), as well as wetland resources within the entire area associated with the Legacy Nature Preserve. Consequently, the acreage of wetland resources described in this section is less than that discussed in the Final EIS.

Wetland Delineation and Reverification

As described in the June 2000 Final EIS, wetlands in the study area were originally characterized and mapped between April and July 1997, as documented in the *Legacy–West Davis Wetlands Delineation Technical Report* (Baseline Data Inc. 1998). Delineated wetlands were then classified and subjected to a wetlands functional assessment, which was described in the *Legacy Parkway Wetland Final HGM Technical Report* (Baseline Data Inc. 2000). Both technical reports were summarized in Appendix B of the June 2000 Final EIS. In August 1998, the Corps approved the delineation and the proposed wetlands functional assessment concept. Additional wetland mapping was done to identify wetlands present in the Legacy Nature Preserve.

To verify the accuracy of the wetland delineation and to provide updated information for the Supplemental EIS analysis, wetlands within and bordering the proposed right-of-way for Alternative D (the Final EIS Preferred Alternative) were visually inspected between October 28 and November 7, 2003. Changes noted during these field surveys were documented in a wetlands reverification letter report and submitted to the Corps on March 16, 2004 (Preston pers. comm.). This report determined that approximately 58 of the 124 wetland polygons located within or intersected by (i.e., cut or divided) the right-of-way of Alternative D (Final EIS Preferred Alternative) had been entirely or partially filled during clearing and grading of the 100-m (328-ft) right-of-way prior to the court-ordered suspension of construction activities associated with the Legacy Parkway project. The remaining 66 wetlands intersected by the right-of-way have not been altered since the previous wetland delineation, with the exception of one wetland polygon that had been filled with concrete rubble as a result of an action not related to the proposed Legacy Parkway project. This updated information was verified by the Corps on November 8, 2004 (Kang pers. comm.).[1]

Of note, aerial photography used to determine elevation contours on the Legacy Nature Preserve was collected in 2004. These contours were used in conjunction with the verified wetland delineation to design mitigation activities proposed for the Legacy Nature Preserve.

Wetlands Functional Assessment

As presented in the Final EIS, the wetlands functional assessment for wetlands in the study area was developed from the hydrogeomorphic (HGM) method for evaluating wetland functions initially developed by the Corps (Brinson 1993). The HGM method categorizes wetlands by their water sources, hydrodynamics, and geomorphic setting, and then evaluates wetland functions based on physical and biological attributes. The wetlands functional assessment was used to quantitatively measure how well wetlands in the study area function. This measurement was used, in part, to determine how much mitigation would be needed, rather than basing that determination on wetland acreage alone. At the time this Supplemental EIS was prepared, an updated regional HGM model was in progress but was not complete enough to offer the accuracy or precision needed to update the wetlands functional assessment information presented in the Final EIS. As a result, the quantitative information on wetland functions

[1] It should be noted that Table 4-20 in the Final EIS indicates that there are 80 wetland polygons within the Alternative D right-of-way, which is fewer polygons than described herein (i.e., 124 wetland polygons) because wetland complexes in the Final EIS were, in some cases, aggregated; that is, some wetland complexes in the Final EIS comprised several wetland polygons.

presented in this document continues to be based on the wetlands functional assessment conducted for the Final EIS.

Additional information about wetland types in the study area and further clarification about how the wetlands functional assessment was performed, including the type of data used, the rationale for the approach to assessing indirect impacts on wetland functions, and the method for scaling the variables used in the assessment models, are included in Appendix D, *Wetlands Functional Assessment*.

Regulatory Update

Since publication of the Final EIS, a Supreme Court ruling (*Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers*, No. 99-1178 [January 9, 2001]) (SWANCC) addressed the issue of whether certain wetlands are subject to federal jurisdiction under Section 404 of the federal Clean Water Act (CWA). In the SWANCC decision, the Supreme Court ruled that, for nonnavigable, isolated, intrastate wetlands, providing habitat for migratory birds was insufficient as the sole basis for assertion of federal jurisdiction under the CWA. This ruling removed a part of the regulatory definition of “waters of the United States” under which many small isolated wetlands have been afforded CWA protection. Other criteria for establishing jurisdiction under the CWA remain unaffected by the SWANCC case, including having a connection with interstate commerce or being adjacent or tributary to other waters of the United States (33 CFR Section 328.3[a]).

The Corps has determined that Great Salt Lake and the wetlands adjacent to it are jurisdictional waters of the United States. Specifically, the Corps has determined that Great Salt Lake is a water of the United States because it is navigable-in-fact and has been found to have substantial connections with interstate commerce, as noted in the 2001 memorandum concerning isolated waters from the General Counsel of the Environmental Protection Agency and the Corps Chief Counsel. Great Salt Lake is fed by the Bear River, the Weber River, and the Jordan River. The Bear River is an interstate water that originates in Utah, flows though a portion of Idaho, then returns to Utah before entering Great Salt Lake. Wetlands in the study area have been determined by the Corps to be adjacent to Great Salt Lake. Although most of the wetlands in the study area have been designated as groundwater slope or depressional wetlands, many of them form extensive wetland complexes and lie within Great Salt Lake’s historic high-water elevation (1,283 m [4,212 ft]), and most are within the area of influence of maximal lake flooding (1,286 m [4,220 ft]). Many of the groundwater slope wetlands are interconnected by surface water flow and are connected to Great Salt Lake by direct flow or by streams and drainage channels. In addition, the wetlands in the Legacy Parkway project study area help sustain the water quality, habitat support, and other functions of the Great Salt Lake Ecosystem (GSLE). Accordingly, the Corps has determined that all the delineated wetlands in the study area remain jurisdictional and are subject to regulation under Section 404 of the CWA; the SWANCC ruling did not affect this protection.

4.12.1.2 Changes since Draft Supplemental EIS

Several changes have been made to the text in this section since the Draft Supplemental EIS was published in December 2004. Those changes were made for the following reasons.

- The acreage of direct impacts on wetlands disclosed in Table 4.12-5 have been updated to reflect minor modifications that were made to the alignments of Alternative A and E (Final Supplemental EIS Preferred Alternative) since preparation of the Draft Supplemental EIS. A description of these modifications are provided in Section 4.0, *Introduction*, and Section 3.4.2, *Modified Build Alternatives A, B, C, and D/E*, of this document.

- Some information in this section were found to be based on incorrect calculations and has been subsequently revised. These calculations include the percentage of wetlands in the study area that would be converted to open water at high lake levels (see Section 4.12.2.4, *Wetlands and Great Salt Lake Flooding*), the percentage of wetlands in the study area that would be indirectly affected by future development not related to Legacy Parkway (see Section 4.12.3.2, *Indirect Impacts*), and the acreage of wetlands that would be directly affected by Alternative B.

- A description of the adequacy of the proposed mitigation package (i.e., the Legacy Nature Preserve) to offset impacts associated with Alternative E (Final Supplemental EIS Preferred Alternative) has been added to Section 4.12.3.4, *Mitigation Measures.* Section 4.12.3.4 has also been updated to include a discussion of how Great Salt Lake inundation levels would affect the Legacy Nature Preserve.

4.12.2 Affected Environment

The study area, which is described above in Section 4.12.1, *Methodology*, encompasses 987 ha (2,439 ac) of wetlands in three HGM wetland classes (depressional, groundwater slope, and lacustrine fringe) and seven wetland cover types (forested wetland, shrub-scrub, marsh, wet meadow, playa, unconsolidated shore, and open water) (Figure 4.12-1). Table 4.12-1 provides information on the acreage of each wetland class, according to cover type. The baseline information on wetlands and land use in the study area used in this analysis was collected between 1997 and 1999. Therefore, *existing conditions*, as used in this section, refers to the extent, character, and functions of wetlands in the study area as they existed in 1997–1999.

The Final EIS based all quantitative discussion of wetland functions, impacts, and mitigation on the three wetland classes mentioned above—depressional, groundwater slope, lacustrine fringe (Figure 3-22 in the Final EIS). However, this Supplemental EIS separates wetland functions, impacts, and mitigation by wetland cover type to provide additional ecological context by which to interpret the analysis. Table 4.12-1, which updates and supplements Table 3-30 in the Final EIS, summarizes the quantities and functional ratings that characterize these wetland classes and cover types. Functional ratings assigned to the wetlands were based on the average functional value for all wetland functions. These functional ratings can range from low to high in accordance with the average functional values shown in Table 4.12-2.

Section 4.12.2.4, *Wetlands and Great Salt Lake Flooding*, of this document provides a discussion of how wetlands are affected by Great Salt Lake flooding.

Table 4.12-1 Wetland Cover Types, Quantities, and Functional Ratings for the Study Area

HGM Class	Wetland Cover Type	Quantity in Hectares (acres)											
		Total		High		High-to-Medium		Medium		Medium-to-Low		Low	
Depressional	Forested Wetland	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Groundwater Slope	Forested Wetland	0.2	(0.4)	0.0	(0.0)	0.0	(0.0)	0.2	(0.4)	0.0	(0.0)	0.0	(0.0)
Lacustrine Fringe	Forested Wetland	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Depressional	Shrub-Scrub	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Groundwater Slope	Shrub-Scrub	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Lacustrine Fringe	Shrub-Scrub	1.4	(3.6)	0.0	(0.0)	1.4	(3.6)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Depressional	Marsh	14.5	(35.8)	0.7	(1.7)	5.5	(13.6)	8.0	(19.7)	0.3	(0.8)	0.0	(0.0)
Groundwater Slope	Marsh	42.3	(104.5)	6.4	(15.8)	2.1	(5.3)	26.3	(64.9)	7.5	(18.5)	0.0	(0.0)
Lacustrine Fringe	Marsh	233.2	(576.1)	0.0	(0.0)	206.3	(509.7)	26.9	(66.4)	0.0	(0.0)	0.0	(0.0)
Depressional	Wet Meadow	115.3	(284.9)	2.6	(6.5)	84.0	(207.6)	26.7	(66.0)	1.9	(4.8)	0.0	(0.0)
Groundwater Slope	Wet Meadow	152.4	(376.6)	80.8	(199.6)	18.2	(45.1)	48.9	(120.9)	4.5	(11.1)	0.0	(0.0)
Lacustrine Fringe	Wet Meadow	148.1	366.0	0.0	(0.0)	98.9	(244.5)	49.2	(121.5)	0.0	(0.0)	0.0	(0.0)
Depressional	Playa	46.4	(114.6)	3.5	(8.6)	31.3	(77.3)	10.5	(26.0)	0.0	(0.0)	1.1	(2.6)
Groundwater Slope	Playa	18.1	(44.7)	15.2	(37.6)	0.0	(0.0)	2.7	(6.6)	0.2	(0.4)	0.0	(0.0)
Lacustrine Fringe	Playa	124.5	(307.6)	0.0	(0.0)	99.7	(246.3)	24.8	(61.3)	0.0	(0.0)	0.0	(0.0)

HGM Class	Wetland Cover Type	Quantity in Hectares (acres)											
		Total		High		High-to-Medium		Medium		Medium-to-Low		Low	
Depressional	Unconsolidated Shore	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Groundwater Slope		0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)
Lacustrine Fringe		38.9	(96.2)	0.0	(0.0)	36.5	(90.1)	2.5	(6.1)	0.0	(0.0)	0.0	(0.0)
Depressional	Open Water	2.5	(6.2)	0.0	(0.0)	1.4	(3.5)	1.1	(2.7)	0.0	(0.0)	0.0	(0.0)
Groundwater Slope		0.1	(0.2)	0.0	(0.0)	0.0	(0.0)	0.1	(0.2)	0.0	(0.0)	0.0	(0.0)
Lacustrine Fringe		49.4	(122.1)	0.0	(0.0)	25.1	(62.0)	24.3	(60.1)	0.0	(0.0)	0.0	(0.0)
Total		987.2	(2439.3)	109.2	(269.8)	610.5	(1508.5)	252.1	(622.9)	14.4	(35.5)	1.1	(2.6)

Table 4.12-2 Average Functional Values for Functional Rating

Functional Rating	Average Functional Value
High	0.88 to 1.0
High-to-Medium	0.63 to 0.87
Medium	0.38 to 0.62
Medium-to-Low	0.18 to 0.37
Low	0.00 to 0.17

4.12.2.1 Hydrogeomorphic Wetland Classes

As described in the Final EIS, wetlands in the study area can be categorized by geomorphic setting, water source, and hydrodynamics. As mentioned above, three wetland classes, which were defined on the basis of these characteristics, are present in the study area: depressional, groundwater slope, and lacustrine fringe. It is presumed that wetlands above the 4,212-ft elevation (i.e., the FEMA floodplain elevation) would more likely be subject to development in the future, with or without the proposed action, than would wetlands below this elevation.

Depressional Wetlands

As described in the Final EIS, depressional wetlands are characterized by topographic depressions or basins where surface waters collect. The primary hydrology source is precipitation, both direct and from surface runoff, although the deeper basins may also intersect the groundwater table. The hydrodynamics are primarily vertical, although horizontal flow may occur when basins fill to capacity and overflow via one or more outlets. Depressional wetlands vary in depth, and because the lower elevations remain wet for longer periods of time, the deeper parts of the wetlands support vegetation types that require more water than the margins or the shallower wetlands.

The areas west of Redwood Road have many depressional wetlands where precipitation is the major hydrological source. Wetland hydrology of these depressional wetlands usually peaks in March and April, when snowmelt and precipitation events are most frequent. The rest of the depressional wetlands derive their hydrology from a combination of precipitation, groundwater, and surface flows.

There are approximately 178 ha (441 ac) of depressional wetlands in the study area, comprising 18 percent of all wetlands in the study area. They are scattered throughout the study area, mostly above the 4,212-ft elevation. The largest concentration in the study area occurs west of Redwood Road, between Center Street and 500 South. Most of these wetlands have a high-to-medium functional rating score.

Groundwater Slope Wetlands

As described in the Final EIS, groundwater slope wetlands are found in areas where the subsurface groundwater intersects the soil surface. The hydrodynamics are primarily horizontal and unidirectional, with flow moving from the groundwater table through the wetlands to an outlet. Some groundwater slope wetlands in the study area are associated with small surface streams or creeks that have their origins in small seeps and springs near the foot of the Wasatch Mountains. Most groundwater slope wetlands are found west of Farmington and, to a lesser extent, west of Redwood Road

There are approximately 213 ha (526 ac) of groundwater slope wetlands in the study area, comprising 21 percent of all wetlands in the study area. Most of the groundwater slope wetlands are located above the 4,212-ft elevation in two areas: west of Redwood Road between 2425 South and 500 South, and west of I-15 north of Glovers Lane. Most groundwater slope wetlands have a high functional rating score.

Lacustrine Fringe Wetlands

As described in the Final EIS, lacustrine fringe wetlands are found at the edge or fringe of Great Salt Lake. The hydrodynamics are bidirectional, with wetland hydrology derived directly from the lake or impoundment. The lake (impoundment) level fluctuates, depending on the time of year. During the spring, water is at the highest level and may slowly draw down through the summer and fall. Water depths are usually 2 m (6.5 ft) or less. There are approximately 596 ha (1,472 ac) of lacustrine fringe wetlands in the study area. Lacustrine fringe wetlands comprise 60 percent of all wetlands in the study area. These wetlands occur along the western border of the study area south of Glovers Lane, mostly at or below the 4,212-ft elevation. As noted in Section 4.12.2.4, *Wetlands and Great Salt Lake Flooding*, lacustrine fringe wetlands farther from the lake may be supported only by precipitation or by groundwater when the lake level is low. When not subject to lake inundation, they perform similarly to depressional wetlands. Most of the lacustrine fringe wetlands have a high-to-medium functional rating score.

The wetlands that surround the Farmington Bay Waterfowl Management Area (FBWMA) are lacustrine fringe wetlands of Great Salt Lake. These wetlands are important because the area is used heavily by waterfowl and shorebirds and functions as flood storage for Great Salt Lake during high-water years.

4.12.2.2 Wetland Cover Types

Within each of the three HGM wetland classes described in Section 4.12.2.1, *Hydrogeomorphic Wetland Classes*, there can be several different wetland vegetation cover types. As mentioned above, there are seven cover types present in the study area; these cover types are listed in Table 4.12-3 and described in detail in Appendix D, *Wetlands Functional Assessment*. Section 4.13, *Wildlife*, also presents information on the wildlife use of these wetland cover types. Because the wetlands analysis focused more on the vegetation and physical properties of the wetlands and the wildlife analysis focused primarily on wildlife use of the wetlands, the approach, methodology, and habitat types for the wildlife analysis differed from those used for the wetlands analysis. Table 4.12-3 presents a comparison of wetland cover types analyzed in this section and corresponding wildlife habitat types analyzed in Section 4.13 of this document. Although only wetland cover types are discussed in this section, surrounding uplands also affect the ability of wetlands to perform their functions. Section 4.13, *Wildlife*, of this document discusses uplands more specifically.

Table 4.12-3 Comparison of Wetland Cover Types and Corresponding Wildlife Habitat Types

Wetland Cover Type	Wildlife Habitat Type
Forested wetland	Riparian*
Scrub-shrub	Riparian*
Marsh	Sedge Cattail
Wet meadow	Hydric Meadow
Playa	Mudflat/pickleweed
Unconsolidated shore	Mudflat/pickleweed
Open water	Open water

Note:
*Riparian wildlife habitat contains uplands as well as wetlands.

4.12.2.3 Wetland Functions

For this Supplemental EIS, the lead agencies reviewed the wetlands functional assessment conducted for the Final EIS and all available information pertinent to the nature and function of the wetlands in the study area. Appendix D, *Wetlands Functional Assessment*, provides a detailed description of wetland functions and functional capacity units. In summary, as described in the Final EIS, wetlands in the study area perform functions in three basic categories: hydrology, biogeochemistry, and flora and fauna habitat support. For this evaluation, these three function categories were quantified by measuring five specific functions.

- Function 1: Wetland hydrology maintenance.
- Function 2: Dissolved elements and compounds removal.
- Function 3: Particulate retention.
- Function 4: Habitat structure.
- Function 5: Habitat connectivity, fragmentation, and patchiness.

Hydrology is quantified under Function 1, biochemistry is quantified under Functions 2 and 3 (although Function 3 also quantifies physical properties), and flora and fauna habitat support are quantified under Functions 4 and 5. A discussion of wetland functions in the study area is provided in Appendix D, *Wetlands Functional Assessment*.

4.12.2.4 Wetlands and Great Salt Lake Flooding

Lacustrine fringe wetlands adjacent to Great Salt Lake are subject to Great Salt Lake's natural long-term cycles of rising and falling.[2] As a consequence, wetland functions in the lacustrine fringe wetlands change naturally in accord with the varying hydrologic regime and are not constant. The effects of changing lake levels are analyzed in detail in the wildlife technical memorandum (Jones & Stokes 2005) and summarized in Section 4.13.3.2, *Changes in Lake Level and Habitat Availability*, of this document.

The natural flood-drought cycle alters the composition and structure of the vegetation in the wetlands adjacent to Great Salt Lake, with subsequent changes in wetland functions that are vegetation-dependent. In the initial stages, abundant runoff into the wetlands adjacent to the lake promotes the development of marsh vegetation. Salts are leached from the soil, and the plant community becomes less halophytic. As Great Salt Lake rises, however, vegetation on the lake margins is affected by increased salinity and prolonged submersion. As floodwaters expand the lake margin eastward, the vegetation east of the lake becomes more hydrophytic. Areas dominated by upland vegetation are converted to wetlands under the new hydrologic regime. Wave action breaks up the dead vegetation and scours the now-denuded lake margins, converting vegetated wetlands to open water. At high lake level (i.e., 4,212 ft), more than 64 percent of the wetlands in the study area would be converted to open water (Jones & Stokes 2005).

As the lake waters recede, bare ground and mudflats are left. At first, halophytic vegetation is established. The influx of salts during flood events is important for maintaining the playas. In depressional areas, salts accumulate as the surface water evaporates, maintaining playas and wet meadows dominated by halophytes. Freshwater marsh and wet meadow develop where groundwater discharge supports wetland vegetation and where salt-laden runoff is exported by surface drainage. As salts are flushed from the soil by surface runoff or by groundwater discharge, the plant communities change over time to become less halophytic. Areas no longer subject to wetland hydrology are colonized by upland species.

Changing lake levels also affect other wetland functions. Lacustrine fringe wetlands are supported by lake water. During extended drought periods, when lake levels fall, wetlands immediately adjacent to the lake

[2] In addition to lacustrine fringe wetlands, depressional and slope wetlands can be affected by changes in the level of Great Salt Lake, depending on the elevation of the lake and the elevation of the particular wetlands.

may still receive some hydrologic input from the lake water. However, lacustrine fringe wetlands farther from the lake may be supported only by precipitation or by groundwater when the lake level is low and will function similarly to depressional wetlands.

The ability of wetlands to remove dissolved substances and retain particulates is directly related to the cover and biomass of the wetland vegetation. At the highest lake levels, much of the area once covered by wetlands has been converted to open water habitat. Consequently, the ability of wetlands along the east shore of the lake to filter dissolved substances and retain particulates is greatly reduced during flood events, and their function as a buffer between development and the lake is also greatly reduced.

Wetlands east of Great Salt Lake are important for providing a diversity of habitats. This habitat diversity is maintained to a large degree by variation in the lake level. When the lake floods, the wildlife habitat function of the wetlands changes greatly. As the lake levels drop, these changes begin to reverse. Playas and other saline wetlands become reestablished, together with the wildlife dependent on them. At other locations, large unvegetated areas are exposed, and there is a lag period before the wetland and upland habitat becomes reestablished. This natural cycle of flood disturbance also makes the wetlands more vulnerable to invasion by exotic species, which displace native plant species and do not provide the same habitat value as native species.

The wetlands functional assessment was conducted for current conditions, i.e., low lake levels. Under a different hydrologic regime, i.e., high or intermediate lake levels, there would be differences in the quantity and relative abundance of each wetland type in every wetland category and differences in wetland functions.

4.12.3 Environmental Consequences and Mitigation Measures

As described in the Final EIS, all the build alternatives would affect wetland resources in the study area. Two categories of wetland impacts would occur, direct and indirect, both of which are characterized in this discussion according to which wetland functions are being affected. The Final EIS based the quantitative discussion of wetland impacts on the three HGM wetland classes described in Section 4.12.2.1. This section separates wetland impacts according to wetland cover types to provide additional ecological context by which to interpret the analysis. This section also provides updated information on the following topics.

- The acreage of wetlands filled due to construction of the Legacy Parkway project since publication of the Final EIS (i.e., Alternative D [Final EIS Preferred Alternative]).
- Additional acres of wetlands located on parcels added to the proposed Legacy Nature Preserve after publication of the Final EIS.
- Updated information relative to direct wetland impacts based on the narrowed right-of-way width proposed for the build alternatives (95 m [312 ft] vs. 100 m [328 ft]).

Wetlands directly affected (i.e., filled) by projects not related to the Legacy Parkway project were included in the cumulative effects analysis and are discussed in Section 4.21, *Cumulative Effects*.

The following sections describe wetland impacts for all the proposed build alternatives.

4.12.3.1 Direct Impacts

Direct impacts are impacts that would occur as a result of ground disturbance, including earthwork (clearing, grading, excavation, and fill) to create the road bed, the landscaped berm, and the trail; construction of bridges and other structures; utility relocations; construction vehicle traffic; and staging and storage areas.

For the initial impact analysis calculations made for the Final EIS, it was assumed that direct impacts associated with the build alternatives would be limited to the area within the proposed action right-of-way, and that all the area within the project right-of-way would be directly affected. This Supplemental EIS makes the same assumption; the impact analysis was carried out by assuming that all wetlands within the project right-of-way would be filled. However, site-specific conditions at some locations within the right-of-way could allow the final design to incorporate a narrower footprint (i.e., narrower than the proposed 95 m (312-ft) right of way); consequently, some wetland areas within the right-of-way may not actually be filled. As a result, estimated impacts on wetlands are considered a worst-case analysis. A separate analysis was carried out for each proposed build alternative.

Fifty-eight wetlands were entirely or partially filled by the initial clearing and grading for Legacy Parkway or by Legacy-related construction activities associated with the I-15/US-89 interchange in Farmington; the total extent of project-related fill was 19.4 ha (47.9 ac). Five other wetlands were partially filled by construction of temporary access roads in the Legacy Nature Preserve; the total extent of project-related fill in the Legacy Nature Preserve was 0.1 ha (0.3 ac). Because these wetlands were filled in conjunction with the Legacy Parkway project, their condition prior to the construction activities was used for assessing baseline conditions.

Table 4.12-4, which updates Table 4-20 in the Final EIS, summarizes the potential direct impacts in terms of the total area affected by each proposed build alternative, assuming the 100-m (328-ft) right-of-way used for evaluation in the Final EIS. Figures 4-14a through 4-14d in the Final EIS show the wetland polygons that would be directly affected by the right-of-way of each build alternative, assuming a 100-m (328-ft) right-of-way.

Table 4.12-4 Direct Impacts on Wetlands by Wetland Class and Wetland Cover Type (for 100-m [328-ft] Right-of-Way)

		Area in Hectares (Acres)							
Wetland Class	Wetland Cover Type	Alternative A		Alternative B		Alternative C		Alternative D	
Depressional		0	(0)	0	(0)	0	(0)	0	(0)
Groundwater Slope	Forested Wetland	0	(0)	0	(0)	0	(0)	0	(0)
Lacustrine Fringe		0	(0)	0	(0)	0	(0)	0	(0)
Depressional		0	(0)	0	(0)	0	(0)	0	(0)
Groundwater Slope	Shrub-Scrub	0	(0)	0	(0)	0	(0)	0	(0)
Lacustrine Fringe		0	(0)	1	(3)	0	(0)	0	(0)
Depressional	Marsh	1	(2)	2	(4)	1	(2)	1	(3)

Wetland Class	Wetland Cover Type	Area in Hectares (Acres) Alternative A		Alternative B		Alternative C		Alternative D	
Groundwater Slope		1	(2)	4	(10)	1	(4)	1	(3)
Lacustrine Fringe		8	(19)	16	(38)	7	(17)	7	(18)
Depressional	Wet Meadow	17	(43)	15	(38)	17	(42)	17	(42)
Groundwater Slope	Wet Meadow	8	(19)	11	(26)	7	(16)	6	(14)
Lacustrine Fringe	Wet Meadow	4	(9)	7	(16)	9	(23)	4	(9)
Depressional	Playa	2	(5)	4	(10)	6	(14)	5	(12)
Groundwater Slope	Playa	0	(0)	2	(5)	1	(4)	1	(2)
Lacustrine Fringe	Playa	1	(2)	2	(5)	6	(14)	2	(4)
Depressional	Unconsolidated Shore	0	(0)	0	(0)	0	(0)	0	(0)
Groundwater Slope	Unconsolidated Shore	0	(0)	0	(0)	0	(0)	0	(0)
Lacustrine Fringe	Unconsolidated Shore	0	(0)	6	(15)	5	(13)	0	(0)
Depressional	Open Water	0	(0)	0	(0)	0	(0)	0	(0)
Groundwater Slope	Open Water	0	(0)	0	(0)	0	(0)	0	(0)
Lacustrine Fringe	Open Water	3	(7)	7	(16)	0	(0)	3	(7)
Totals*		44	(108)	76	(187)	60	(148)	46	(114)

Note:
* Includes acreage of wetlands already filled during previous construction activities.

Reduction of the right-of-way width from 100 m (328 ft) to 95 m (312 ft) would reduce impacts on wetlands under all proposed build alternatives, as illustrated in Table 4.12-5. Because the HGM model was not re-run to account for the proposed narrower right-of-way (i.e., 95 m [312 ft]), the discussion of indirect impacts and impacts on wetland functions presented below is based on the 100-m (328-ft) right-of-way analyzed in the Final EIS. As a result, for those impact categories, a discussion of impacts associated with Alternative E is not specifically presented. Given the narrower right-of-way of Alternative E, it can be assumed that indirect impacts and impacts on wetland functions are somewhat less than those presented for Alternative D. The acreage of direct impacts on wetlands associated with Alternatives D and E has been differentiated and is shown in Table 4.12-5.

Table 4.12-5 Direct Impacts on Wetlands under 328-ft Right-of-Way and 312-ft Right-of-Way

	Build Alternatives in hectares (acres)			
	Alternative A	Alternative B	Alternative C	Alternatives D and E*
Acreage of Wetlands Impact – 100-m (328-ft) Right-of-Way	44 (108)	76 (187)	60 (147)	46 (114)
Reduction in Wetlands Impact Associated with Narrower 95-m (312-ft) Right-of-Way	1 (1)	2 (5)	1 (2)	1 (1)
Acreage of Wetland Impact – 95-m (312-ft) Right-of-Way	43 (107)	74 (182)	59 (145)	45 (113)

Notes:

All conversions have been rounded.

* Alternative D represents the 100-m (328-ft) right-of-way alignment from the Final EIS; Alternative E represents the 95-m (312-ft) right-of-way alignment evaluated in the Supplemental EIS.

Design flexibility, or the opportunity for the designer to modify facility components (consistent with design standards), was used during the design-build phase to reduce the project footprint and subsequent impact on wetland resources. The design-builder identified 6 ha (14 ac) of wetlands in the right-of-way of Alternative D (Final EIS Preferred Alternative) that would not be affected during construction (i.e., would not need to be filled to construct the highway or associated facilities). The updated analysis of the design shows that the design flexibility would be somewhat less available, although it could result in a reduction of 3.2 ha (8 ac) of impacts on wetlands under Alternative A and a reduction of 4.0 ha (10 ac) under Alternative E, primarily in the area associated with the southern interchange. It is likely that a similar amount of wetland area would be avoided during construction of Alternatives B and C. Although design flexibility during project construction would reduce impacts on wetlands, the exact acreage that could be avoided under Alternatives B and C is not known, and therefore the wetlands impact analysis presented below for the build alternatives is based on the impact acreage figures in Table 4.12-5.

No-Build Alternative

Existing Conditions

Under the No-Build Alternative, there would be no project-related direct impacts on wetland resources. If none of the build alternatives is chosen, wetlands affected by project-related impacts to date (2005) would either be restored to preconstruction conditions or the impacts would be mitigated, at the instruction of the Corps. Areas currently designated for incorporation into the Legacy Nature Preserve that are not used to mitigate project-related impacts on wetlands would, under current law, be required to be made available (i.e., sold) to either the original property owner or the general public. Accordingly, these lands would be made accessible to a variety of future uses, including potential development (see *Future Conditions [2020]* below).

Future Conditions (2020)

At the current rate of development, developable lands between the existing developed areas east of Legacy Parkway and Great Salt Lake will likely be developed by 2020.[3] Wetland resources will likely be affected, although the nature, timing, and location of specific impacts were not known at the time the wetlands functional assessment was done or at the time of this Supplemental EIS (see Table 4.13-5). Projects that have occurred since the Final EIS was published and the location of planned development are discussed in Section 4.1, *Land Use*, of this document. Any proposed fill of wetland resources would have to be authorized under Section 404 of the CWA before impacts could occur.

Build Alternatives

Alternative A

Alternative A would have the lowest amount of direct impacts on wetlands of the build alternatives. In the Final EIS, it was calculated that a total of 44 ha (108 ac) of wetlands in the study area would be filled under this alternative. As a result of the reevaluation and project changes, the total acres of direct wetlands impact for this alternative have been reduced to 43 ha (107 ac) (Table 4.12-5). This acreage is based on the assumption that all the wetlands within the reduced right-of-way would be affected by Alternative A; however, as described above, design flexibility would enable UDOT to avoid approximately 3 ha (8 ac) of wetlands within the right-of-way of Alternative A that are not within the construction footprint. As a result, the actual impact on wetlands that would be associated with Alternative A would be 39 ha (99 ac).

Affected wetlands would be at the higher elevations along the east side of the study area, with direct impacts primarily on wet meadow in depressional and groundwater slope wetlands and on marsh in the lacustrine fringe wetlands adjacent to Great Salt Lake.

Alternative B

Alternative B would have the highest amount of direct impacts on wetlands of the build alternatives. In the Final EIS, it was calculated that a total of 76 ha (187 ac) of wetlands in the study area would be filled under this alternative. As a result of the reevaluation and project changes, the total acreage of wetlands subject to direct impacts by this alternative has been reduced to 74 ha (182 ac) (Table 4.12-5). The primary impacts would be on lacustrine fringe wetlands and wet meadow. Marsh, wet meadow, unconsolidated shore, and open water habitats would be filled in the lacustrine fringe wetlands at the lower elevations along the west side of the study area. Wet meadow would also be filled in depressional and groundwater slope wetlands.

Alternative C

Alternative C would have more direct impacts on wetlands than Alternative A or Alternative D, but less than Alternative B. In the Final EIS, it was calculated that a total of 60 ha (147 ac) of wetlands in the study area would be affected under this alternative. As a result of the reevaluation and project changes, the total acreage of wetlands subject to direct impacts by this alternative has been reduced to 59 ha (145 ac) (Table 4.12-5). The primary impacts would be on lacustrine fringe wetlands and wet meadow. Marsh, wet meadow, unconsolidated shore, and open water habitats would be filled in the lacustrine fringe wetlands at the lower elevations along the west side of the study area. Wet meadow would be filled in depressional and groundwater slope wetlands, and playa would be filled in depressional wetlands.

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[3] As described in Appendix D, the term *developable lands* does not include any jurisdictional wetlands or areas below the FEMA floodplain elevation of 4,212 feet.

Alternatives D and E

It was disclosed in the Final EIS that Alternative D would have more direct impacts on wetlands than Alternative A but less than Alternatives B and C. A total of 46 ha (114 ac) of the wetlands in the study area would be filled under this alternative. As a result of modifying Alternative D to create Alternative E with a reduced right-of-way width, the total acres of direct impacts on wetlands for Alternative E would be 45 ha (113 ac) (Table 4.12-5). This acreage is based on the assumption that all the wetlands within the reduced right-of-way would be affected by Alternative E; however, as described above, design flexibility would enable UDOT to avoid approximately 4 ha (10 ac) of wetlands within the right-of-way of Alternative E that are not within the construction footprint. As a result, the actual impact on wetlands that would be associated with Alternative E would be 41 ha (103 ac).

Affected wetlands would be at the higher elevations along the east side of the study area, with direct impacts primarily on wet meadow and playa in depressional wetlands, on wet meadow in groundwater slope wetlands, and on marsh in the lacustrine fringe wetlands adjacent to Great Salt Lake.

4.12.3.2 Indirect Impacts

Indirect impacts are impacts that occur later in time and impacts that could affect the function of wetlands located outside the project footprint. The following effects are examples of indirect impacts that the Legacy Parkway project could have on wetlands.

- During construction, ground disturbance would create wind-blown dust and potential for erosion of sediments into study area wetlands, which could adversely affect wetland hydrology and vegetation.
- Soil disturbance and removal of existing vegetation would increase the potential for the spread of invasive exotic plant species into the study area and potentially into wetlands.
- Construction materials, such as fuel, oil, lubricants, and concrete that may be spilled into study area wetlands, could have adverse affects on vegetation and aquatic invertebrates.
- Construction of a new roadbed could create a barrier to surface water flows, altering the size or character of wetlands. The impervious road surface would also alter the local runoff pattern, affecting the hydrology of depressional wetlands.
- The roadbed may compact underlying soils, altering horizontal groundwater flows immediately adjacent to the proposed highway right-of way.
- De-icing substances (salt, sand, and other substances) could be conveyed into the wetlands, with subsequent adverse effects on the vegetation and supported fauna. Traffic on the new road would generate particulates and contaminants, which could also have adverse effects on wetland habitat.
- Spills of hazardous materials transported on the Legacy Parkway could have adverse affects on vegetation and aquatic invertebrates if the materials enter wetlands.

Many of these indirect effects are discussed in more detail in this document in Section 4.10, *Water Quality*, and Section 4.13, *Wildlife*.

The effects of specific impact mechanisms were not addressed by the wetlands functional assessment conducted for the Final EIS. Instead, an estimate of the general level of wetland function indirectly lost because of project construction was calculated for wetlands within 305 m (1,000 ft) of the project footprint. A separate analysis of indirect impacts was carried out for each alternative, as summarized below. Table D-5 in Appendix D summarizes quantitatively the potential indirect impacts in relation to the total area affected under each proposed alternative. These indirect impacts are in addition to the direct impacts shown in Table 4.12-5. Figures 4-14a through 4-14c in the Final EIS show the wetlands that would be indirectly affected by each alternative. Indirect impacts on wetland functions are discussed in more detail in Section 4.12.3.3, *Impacts on Wetland Functions*, below. As with direct impacts, indirect impacts were assessed assuming the worst-case scenario. Impacts were assessed without accounting for design features of the roadway (e.g., vegetated median and sides slopes, culverts, and drainage structures) that would be used to reduce impacts on adjacent wetlands.

No-Build Alternative

Existing Conditions

Under the No-Build Alternative, there would be no project-related indirect impacts on wetland resources. If none of the build alternatives is selected, wetlands affected by project-related impacts to date (2005) would either be restored to preconstruction conditions or the impacts would be mitigated at the instruction of the Corps. However, areas currently designated for incorporation into the Legacy Nature Preserve that are not used to mitigate project-related impacts on wetlands would be, under current law, beyond UDOT's authority to retain.

Future Conditions (2020)

Currently, open space in Davis County is being developed at a rate of approximately 280 ha (700 ac) per year (Sommerkorn pers. comm. [a]). If growth continues at this rate, which it is projected to do (see Section 4.1, *Land Use*), all the developable land within the study area will be developed by 2020.[4] Even assuming that no wetlands in the study area are filled and therefore directly affected, it is likely that many wetlands in the area will be indirectly affected by this other predicted development. Based on the wetlands functional assessment completed for the No-Build Alternative in the 2000 Final EIS (i.e., to determine the benefits of preservation on wetland function), about 97 percent of the wetlands in the study area would be indirectly affected by 2020 by future development not related to Legacy Parkway (see D.4.1, *Credit for Preservation*, in Appendix D).

Build Alternatives

Alternative A

Of the build alternatives, Alternative A would have the lowest amount of indirect impacts on wetlands. About 218 ha (539 ac) (approximately 22 percent) of wetlands in the study area would be indirectly affected under this alternative. In depressional wetlands, the indirect impacts would be primarily on wet meadow and playa. In groundwater slope wetlands, the indirect impacts would be primarily on wet meadow and marsh. In lacustrine fringe wetlands, the indirect impacts would be on marsh, wet meadow, unconsolidated shore, and open water.

Alternative B

Of the build alternatives, Alternative B would have the greatest amount of indirect impacts on wetlands. About 409 ha (1,011 ac) (approximately 41 percent) of wetlands in the study area would be indirectly

[4] As described in Appendix D, the term *developable lands* does not include any jurisdictional wetlands or areas below the FEMA floodplain elevation of 4,212 feet.

affected under this alternative. This alternative would have substantial indirect effects on all three wetland classes. Much of the indirect effect on wetlands would be on wet meadow, but there would also be substantial indirect effects on marsh, playa, unconsolidated shore, and open water habitats.

Alternative C

Alternative C would have more indirect impacts on wetlands than Alternative A or Alternative D but less than Alternative B. About 367 ha (907 ac) (approximately 37 percent) of wetlands in the study area would be indirectly affected under this alternative. The distribution of effects would be similar to those under Alternative B.

Alternatives D and E

Alternative D would have more indirect impacts on wetlands than Alternative A but less than Alternatives B and C. About 233 ha (575 ac) (approximately 24 percent) of wetlands in the study area would be indirectly affected under this alternative. The distribution of effects would be similar to those under Alternative A. Indirect impacts resulting from Alternative E would be the same as or slightly less than those resulting from Alternative D.

4.12.3.3 Impacts on Wetland Functions

Impacts on wetland functions were quantified using the wetlands functional assessment models developed for the Final EIS (discussed in Section 4.12.1.2, *Wetlands Functional Assessment*). These impacts were calculated as the change in wetland function multiplied by the area of affected wetlands. All wetland functions would be reduced to zero for wetlands or portions of wetlands that would be directly affected within the right-of-way.

Impacts on wetland functions were calculated for each wetland category and each wetland cover type and are summarized below by alternative. Tables E-6 to E-10 in Appendix D, which update and supplement Tables 4-20 and 4-22 in the Final EIS, present these impacts quantitatively by wetland function. As noted above, indirect impacts were assessed without accounting for design features of the roadway (e.g., vegetated median and sides slopes, culverts, and drainage structures) that would be used to reduce impacts on adjacent wetlands.

No-Build Alternative

Existing Conditions

Under the No-Build Alternative, there would be no project-related direct or indirect impacts on wetland functions. If none of the build alternatives is selected, wetlands affected by project-related impacts to date (2005) would either be restored to preconstruction conditions or the impacts would be mitigated at the instruction of the Corps. Areas currently designated for incorporation into the Legacy Nature Preserve that are not used to mitigate project-related impacts on wetlands would, under current law, be required to be made available (i.e., sold) to either the original property owner or the general public. Accordingly, these lands would be made accessible to a variety of future uses, including potential development (see *Future Conditions [2020]* below).

Future Conditions (2020)

As described above, it is likely that, by 2020, all the wetland resources in the study area will be either directly or indirectly affected by planned development. Although the nature and timing of this development is not definitive, such development would affect functions of all the wetland resources in the study area.

Build Alternatives

The following describes how each of the different wetland functions would be affected by the proposed build alternatives.

Hydrology

Function 1: Maintain Wetland Hydrology

The ability of wetlands in the study area to maintain wetland hydrology would be altered by construction of Legacy Parkway. Wetlands that would be filled would lose the ability to perform this function. The impervious road surface would increase the amount of surface runoff in the vicinity of the roadbed, potentially changing the habitat to a more hydric type. The new roadbed would create a barrier to surface water flows, altering the size and/or character of wetlands. Ponding on the upslope side of the roadbed would cause wetlands to pond more deeply and for longer periods, potentially shifting the habitat character toward a more aquatic type, whereas wetlands downslope of the roadbed would become drier, shifting the habitat character to a more upland type. The proposed ground water conveyance structures (see Section 4.10, *Water Quality*) should yield a drainage system that removes barriers to surface water flows and adequately mimics the westward flow of shallow groundwater beneath the right-of-way.

A similar effect on wetland hydrology would be expected if the roadbed compacted underlying soils and altered the subsurface water flows in groundwater seep wetlands. In 2001, between 1.5 m and 1.8 m (5 ft and 6 ft) of fill were placed along the Alternative E alignment between I-215 and 500 South, and up to 6 m (20 ft) of fill were placed in the I-215 interchange area. To determine empirically how these activities would affect local wetland hydrology, a network of piezometers (soil water-pressure gauges) were installed parallel to the fill areas (Forster and Neff 2002). The preliminary results of this study suggest that most water found in the shallow subsurface is likely derived from water discharging upward from underlying deeper aquifers, rather than from water contributed by direct precipitation. Thus, groundwater moving from deeper aquifers is the principal source of water supplying groundwater wetlands near and west of the proposed highway right-of-way. Therefore, it is unlikely that the groundwater supply to those types of wetlands in the project area would be seriously affected by highway construction. Groundwater levels within the project right-of-way would be monitored during project construction to assess potential impacts on wetland hydrology.

Table D-6 in Appendix D quantitatively summarizes the potential impacts of Legacy Parkway in the functional capacity units (FCUs) lost under each build alternative. Because roadway designs that include culvert and drainage structures to facilitate movement of surface and groundwater across the roadway were added after the wetlands functional assessment was completed, the mitigating effects of these features were not included in the FCU calculations.

Alternative A

Alternative A would have the least effect on wetland hydrology. Most direct effects on wetland hydrology would be in depressional wetlands, and most of the indirect effects would be in groundwater slope and lacustrine fringe wetlands. Most wetland cover type affected would be wet meadow, although a large proportion of the indirect effects would be on marsh.

Alternative B

Alternative B would have the largest effect on wetland hydrology. Most direct effects on wetland hydrology would be on wet meadow and marsh cover types in all three wetland classes. Indirect effects would be on wet meadow and marsh cover types, primarily in lacustrine fringe wetlands, but also in groundwater slope wetlands.

Alternative C

Alternative C would have less effect on wetland hydrology than Alternative B but more than Alternatives A and D. Most direct effects on wetland hydrology would be in lacustrine fringe and depressional wetlands, and most of the indirect effects would be on lacustrine fringe wetlands. Most wetland cover types affected would be wet meadow, but much marsh and playa habitat would also be affected.

Alternatives D and E

Alternative D would have less effect on wetland hydrology than Alternatives B and C but more than Alternative A. Most direct effects on wetland hydrology would be in wet meadow in depressional wetlands. Most indirect effects would be on wet meadow in all three wetland classes, although a large proportion of the indirect effects would be on marsh and unconsolidated shore in lacustrine fringe wetlands. The impacts on wetland hydrology resulting from Alternative E would be the same as or slightly less than the impacts resulting from Alternative D.

Biogeochemistry

Function 2: Removal of Dissolved Elements and Compounds

The ability of wetlands in the study area to remove dissolved elements and compounds would be altered by construction of Legacy Parkway. Wetlands that would be filled would lose the ability to perform this function. This function would also be impaired in wetlands adjacent to the build alternatives, where the character of the vegetation would shift to a more upland type or where vegetation cover would decrease. This function would be enhanced where the character of the vegetation would shift to a more wetland type or where vegetation cover would increase. In addition, an increase in the level of dissolved elements and compounds is expected in wetlands adjacent to the road, possible to levels exceeding the wetlands' capacity to perform this function. Table D-7 in Appendix D quantitatively summarizes the potential impacts of Legacy Parkway in the total FCUs lost under each build alternative. Because roadway designs—including vegetated medians and side slopes to capture and absorb roadway runoff, which would minimize the level of dissolved elements and compounds that adjacent wetlands could receive—were added after the wetlands functional assessment was completed, the mitigating effects of these features were not included in the FCU calculations.

Alternative A

Alternative A would have the least effect on the ability to remove dissolved elements and compounds. Most direct effects on this function would be in wet meadows, primarily in depressional wetlands. Most indirect effects on this function would also be in wet meadows, but primarily in groundwater slope wetlands.

Alternative B

Alternative B would have the largest effect on the ability to remove dissolved elements and compounds. Most direct effects on this function would be on wet meadow habitat and on marsh in lacustrine fringe wetlands. Indirect effects would be on wet meadow, primarily in groundwater slope and lacustrine fringe wetlands, and on marsh habitats in lacustrine fringe wetlands.

Alternative C

Alternative C would have less effect on the ability to remove dissolved elements and compounds than Alternative B but more than Alternatives A and D. Most direct effects on this function would be in wet meadow habitat. Most indirect effects on this function would be on wet meadow habitat and on marsh in lacustrine fringe wetlands.

Alternatives D and E

Alternative D would have less effect on the ability to remove dissolved elements and compounds than Alternatives B and C but more than Alternative A. Most direct effects would be in wet meadow, primarily in depressional wetlands. Most indirect effects would be on wet meadow in depressional and groundwater slope wetlands. The impacts on removal of dissolved elements and compounds resulting from Alternative E would be the same as or slightly less than the impacts resulting from Alternative D.

Function 3: Particulate Retention

The ability of wetlands in the study area to retain particulates would be altered by construction of Legacy Parkway. Wetlands that would be filled would lose the ability to perform this function. This function would also be impaired in wetlands adjacent to the Parkway where the character of the vegetation would be shifted to a more upland type or where vegetation cover would decrease. This function would be enhanced where the character of the vegetation would shift to a more wetland type or where vegetation cover would increase. An increase in the input of particulates is expected in wetlands adjacent to the road; such an increase could cause the wetlands to silt in.

Although not addressed by the wetlands functional assessment models, depressional wetlands would respond differently than non-depressional wetlands to an increased influx of particulates. Depressional wetlands would initially have a high capacity to retain particulates, but because water flow is primarily into the wetlands, over time they would silt in and lose this and other functions. In contrast, non-depressional wetlands have a limited capacity to retain particulates and could be overwhelmed by particulate-laden water, so that particulates would pass through them unrestrained. However, because water flows through non-depressional wetlands, particulate-free water would remove particulates from the wetlands, and over time the ability to retain particulates would be restored.

Table D-8 in Appendix D quantitatively summarizes the potential impacts of Legacy Parkway in the total FCUs lost under each build alternative. Because roadway designs—including vegetated medians and side slopes to capture and absorb roadway runoff, which would minimize the level of dissolved elements and compounds that adjacent wetlands could receive—were added after the wetlands functional assessment was completed, the mitigating effects of these features were not included in the FCU calculations.

Alternative A

Alternative A would have less effect on the ability to retain particulates than Alternatives B and C but more than Alternative D. Although Alternative A would have fewer direct effects than Alternative D, it would have more indirect effects than Alternative D. Most direct effects on this function would be in wet meadows, primarily in depressional wetlands. Most indirect effects on this function would be in wet meadows, marsh, and unconsolidated shore.

Alternative B

Alternative B would have the largest effect on the ability to retain particulates. Most direct effects on this function would be on wet meadow habitat and on marsh in lacustrine fringe wetlands. Indirect effects would be on wet meadow, primarily in groundwater slope and lacustrine fringe wetlands, and on marsh habitats in lacustrine fringe wetlands.

Alternative C

Alternative C would have less effect on the ability to retain particulates than Alternative B but more than Alternatives A and D. Most direct effects on this function would be in wet meadow habitat. Most indirect effects on this function would be on wet meadow habitat and on marsh in lacustrine fringe wetlands.

Alternatives D and E

Alternative D would have the least effect on the ability to retain particulates. Most direct effects on wetland hydrology would be in wet meadow, primarily in depressional wetlands. Most indirect effects would be on wet meadow in depressional and groundwater slope wetlands. The impacts on particulate retention resulting from Alternative E would be the same as or slightly less than the impacts resulting from Alternative D.

Flora and Fauna Habitat Support

Function 4: Habitat Structure

The Legacy Parkway project would result in changes in the cover, composition, and hydrophytic character of the wetland vegetation in the study area, which would alter the ability of the wetlands to provide habitat to wildlife. Altering wetland hydrology would change the vegetation type or convert the wetland to upland. Soil disturbance and removal of existing vegetation would increase the potential for spread of invasive exotic plant species into study area wetlands, which would displace the native wetlands plants. If spills of construction materials or hazardous materials into study area wetlands occurred, they would adversely affect both vegetation and aquatic invertebrates. De-icing substances (salt, sand, and other substances) could be conveyed into the wetlands, with consequent adverse effects on the vegetation and supported fauna. Although soils in the project area have naturally high salinity, salts from the roadway would be expected to accumulate in the wetlands.

Contaminants entering the wetland ecosystem at low levels, although not exceeding water quality standards for acute toxicity, would nevertheless be expected to accumulate in the wetland ecosystem. Depressional wetlands, especially those which lack outlets, would be particularly subject to buildup of these substances. The effects of these impacts on wildlife are discussed in more detail in Section 4.13, *Wildlife*, of this document. Table D-9 in Appendix D quantitatively summarizes the potential impacts of Legacy Parkway in the total FCUs lost under each build alternative. Because roadway designs—including vegetated medians and side slopes to capture and absorb roadway runoff, which would minimize the level of dissolved elements and compounds that adjacent wetlands could receive—were added after the wetlands functional assessment was completed, the mitigating effects of these features were not included in the FCU calculations.

Alternative A

Alternative A would have the least effect on habitat structure. Most direct and indirect effects on this function would be in wet meadow, primarily in depressional and groundwater slope wetlands.

Alternative B

Alternative B would have the largest effect on habitat structure. Most direct and indirect effects on this function would be on wet meadow habitat in all wetland classes. There would also be substantial direct and indirect effects on marsh in lacustrine fringe wetlands.

Alternative C

Alternative C would have less effect on habitat structure than Alternative B but more than Alternatives A and D. Most direct effects on this function would be in wet meadow habitat. Most indirect effects on this function would be on marsh in lacustrine fringe wetlands.

Alternatives D and E

Alternative D would have less effect on habitat structure than Alternatives B and C but more than Alternative A. Most direct and indirect effects on habitat structure would be in wet meadow in all three wetland classes. The impacts on habitat structure resulting from Alternative E would be the same as or slightly less than the impacts resulting from Alternative D.

Function 5: Habitat Connectivity, Fragmentation, and Patchiness

The Legacy Parkway project would have adverse impacts on wetland habitat by fragmenting existing wetlands and creating a barrier between the resulting habitat fragments and other adjacent wetlands. In addition to creating a physical barrier, the road would alter the wetland hydrology of wetland complexes, causing some to become drier and others wetter, creating barriers that would prevent some species from moving between the wetlands. Loss of wetland character would also result in the loss of permanent habitat and foraging area. The effects of these impacts on wildlife are discussed in more detail in Section 4.13, *Wildlife*.

Table D-10 in Appendix D summarizes quantitatively the potential impacts of Legacy Parkway in the total FCUs lost under each build alternative. Because roadway design that includes culvert and drainage structures to facilitate movement of surface and groundwater across the roadway were added after the wetlands functional assessment was completed, the mitigating effects of these features were not included in the FCU calculations.

Alternative A

Alternative A would have the least effect on habitat connectivity, fragmentation, and patchiness. Most direct and indirect effects on this function would be in wet meadow, primarily in depressional and groundwater slope wetlands.

Alternative B

Alternative B would have the largest effect on habitat connectivity, fragmentation, and patchiness. Most direct and indirect effects on this function would be on wet meadow habitat in all wetland classes. There would also be substantial direct and indirect effects on marsh in lacustrine fringe wetlands.

Alternative C

Alternative C would have less effect on habitat connectivity, fragmentation, and patchiness than Alternative B but more than Alternatives A and D. Most direct and indirect effects on this function would be on wet meadow habitat in all wetland classes. There would also be substantial direct and indirect effects on marsh in lacustrine fringe wetlands.

Alternatives D and E

Alternative D would have less effect on habitat connectivity, fragmentation, and patchiness than Alternatives B and C but more than Alternative A. Most direct and indirect effects would be in wet meadow in all three wetland classes. The impacts on habitat connectivity, fragmentation, and patchiness resulting from Alternative E would be the same as or slightly less than the impacts resulting from Alternative D.

4.12.3.4 Mitigation Measures

The following sections describe the measures proposed to mitigate impacts on wetland resources associated with implementation of Alternative E. The mitigation measures are described in terms of the three-step sequencing analysis used by the Corps to prioritize what measures are adopted to mitigate wetland impacts: avoidance, minimization, and compensation (e.g., restoration, enhancement, creation). Appendix E, *Analysis of the Adequacy of Wetlands and Wildlife Mitigation*, provides a more detailed review of the mitigation package, presented in terms of function, vegetation cover type, wildlife habitat type, and change in level of Great Salt Lake.

The mitigation package proposed in this section is based on the assumption that all the wetlands within the right-of-way of Alternative E would be filled. While there are 45 ha (113 ac) of wetlands within the maximum (reduced) right-of-way involved in the project, as described in Section 4.12.3.1, *Direct Impacts*, design flexibility would enable UDOT to avoid filling approximately 4 ha (10 ac) of wetlands that are within the right-of-way but would not be within the construction footprint. The proposed mitigation package described below is based on acreages of wetland impacts and estimates of loss of wetland functions that would result from implementation of Alternative E. Since indirect impacts on wetland hydrology and water quality functions may be overstated (i.e., the calculated loss in function was not reduced to reflect incorporation of culverts and drain structures in the roadway) the assessment of project impacts may, in fact, reflect greater impacts than what would actually occur during project construction.

Avoidance and Minimization

As described in Chapter 3, *Alternatives*, five regional alignments were considered in the Final EIS, three of which were eliminated from additional analysis, in part, because of their impacts on wetlands. Within the Great Salt Lake Corridor (i.e., the regional corridor containing the build alternatives evaluated in this Supplemental EIS), avoidance and minimization measures were used as much as possible in designing the alignment for each alternative. As described in the Final EIS, it would not be reasonable to build Legacy Parkway and avoid all impacts on wetlands. The build alternatives analyzed in this section and the Final EIS were evaluated in part because they represented alignments designed specifically to avoid wetland resources. In most cases, these alternatives represented the alternatives with less impacts than the alternatives evaluated and eliminated in previous studies, although some alternatives with lower wetland impacts were eliminated because of cost or relocation impacts or because the alternative failed to meet the project purpose and need (see Chapter 3, *Alternatives*).

Under all proposed build alternatives, measures to minimize wetland impacts would also be implemented during project construction and would be incorporated into the final project design. Floodplain equalization culverts would be placed under the road within the Corps floodplain boundary to maintain hydrologic connections between the east and west sides of the parkway during high lake levels. Surface water conveyance structures would be installed wherever existing hydrologic connections would be cut off by the highway, and groundwater conveyance structures would be installed in areas where fill heights exceed approximately 3 m (10 ft). The roadway design has also been modified to lower the embankment height in non-floodplain areas, which further minimizes the minor effect of soil compaction on the subsurface water table. Best management practices (BMPs) would be used to limit the amount of eroded sediment and other materials that leave the right-of-way. Other mitigation measures for minimizing water quality impacts, such as vegetated filter strips, are discussed in Section 4.10, *Water Quality*.

Compensation

The federal Clean Water Act and its associated guidelines direct the Corps to require compensatory mitigation to replace wetland functions unavoidably lost or adversely affected by a proposed action (after avoidance and minimization measures have been considered). A 1990 MOA between EPA and the Corps states that the Corps should strive to achieve a goal of no overall net loss of wetland functions and values, recognizing, however, that the no net loss of wetland functions and values goal may not be achieved in each and every Corps permit action (U.S. Environmental Protection Agency 1990). The 1990 MOA states that the Section 404 regulatory program should, in the broader sense, consider and contribute to the national goal of no overall net loss of the nation's remaining wetland base.

Additional guidance from the Corps states that a project applicant may be given compensatory mitigation credit for preservation activities when existing wetlands are preserved in conjunction with establishment, restoration, and enhancement activities (Regulatory Guidance Letter No. 02-2, December 24, 2002). This supplementary guidance letter states that, in exceptional circumstances, the preservation of existing wetlands or other aquatic resources may be authorized as the sole basis for mitigation if the wetlands (1) perform important physical, chemical, or biological functions, the protection and maintenance of which is important to the region where those aquatic resources are located; and (2) are under demonstrable threat of loss or substantial degradation from human activities that might not be otherwise avoided. The existence of a demonstrable threat should be based on clear evidence of destructive land use changes that are consistent with local and regional land use trends, and that are not the consequence of actions under the permit applicant's control.

The proposed compensatory mitigation package for Legacy Parkway includes restoration and enhancement, creation, and preservation of wetland habitats, as described below.

Preservation

An important component of the mitigation for wetland impacts would be protection in perpetuity of 315 ha (778 ac) of wetlands in the Legacy Nature Preserve. As mitigation, preservation would allow a net loss of wetland acres, but would remove future development threats that could result in the loss or decline of wetland functions. As described below, preservation was recognized as a valuable component of the Legacy Nature Preserve because of the importance of shorelands habitat to the region and a demonstrable threat that wetlands within the Preserve area would be lost and/or degraded in the future.

The wetland complexes along the eastern shore of Great Salt Lake perform important physical, chemical, and biological functions. They are a buffer between the lake and developed lands in the I-15 corridor, provide flood storage during high-water years, and serve as a filter for surface waters flowing into the lake from the east. They provide nesting and foraging habitat for waterfowl and shorebirds and upland refuge habitat during flood events. Proposed mitigation lands would protect and maintain this buffer between the lake and developed lands in perpetuity.

Wetlands in the study area are under demonstrable threat of loss or substantial degradation from human activities not associated with the Legacy Parkway project. Most of these wetlands already have been degraded by agricultural conversion, development, and other land use changes. They face continued threats from projected growth and development in and to the west of the study area. The wetlands are interspersed with substantial areas of uplands that can be developed without obtaining wetland permits. The threats, therefore, are not only from direct changes to the wetlands but from the indirect effects that may result if available upland is, as projected, fully developed. As described in Section 4.1, *Land Use*, open space in Davis County is being developed at the rate of approximately 280 ha (700 ac) per year (Davis County 2003f). If this rate of development continues, which it is projected to do, most of the study area will be developed by 2020. As explained in the Final EIS, this development is projected to occur on uplands and does not account for possible authorized direct wetland filling for future development.

The Final EIS proposed establishing the Preserve to protect and maintain a buffer between Great Salt Lake and future development. A conceptual preserve was originally designed for each alternative that would preserve wetlands at a mitigation ratio of approximately 3:1 (three times as much area of wetlands preserved as wetlands lost) as well as providing wetland enhancement and restoration in addition to preservation. Four different conceptual preserves were developed, each configured according to the location of the alternative alignment and the amount of affected wetlands (see Figures 4-14a through Figure 4-14d in the Final EIS).

This document identifies Alternative E as the Final Supplemental EIS Preferred Alternative. Accordingly, the following description of the Legacy Nature Preserve is based on impacts that would be associated with Alternative E. If the lead agencies were to authorize construction of a build alternative other than Alternative E, a mitigation package commensurate with the package proposed for Alternative E (i.e., based on a comparable analysis, the same principles, and the same mitigation ratios) would be proposed, with input from the Corps and other regulatory agencies.

Legacy Nature Preserve

As described in the Final EIS, the Legacy Nature Preserve was proposed to protect the large tracts of wetland complexes adjacent to Great Salt Lake that are at risk of being lost or impaired by future development.

Section 4.12.4 of the Final EIS described the areal extent of the Legacy Nature Preserve associated with each build alternative. Based on the wetlands functional assessment in combination with an established ratio of area preserved wetlands to wetlands lost, the Legacy Nature Preserve was proposed to encompass approximately 506 ha (1,251 ac) for Alternative D (Final EIS Preferred Alternative). An additional 126 ha (317 ac) of mitigation lands proximate to the FBWMA were added to the Legacy Nature Preserve associated with Alternative D (Final EIS Preferred Alternative) at the request of USFWS. This area is important to wildlife when the level of Great Salt Lake is high, was a major bird use area during the 1983 flood event, and would provide a buffer to FBWMA from future development. In addition, after publication of the Final EIS and during preparation of the respective Records of Decision (RODs) by the Corps and FHWA, four additional parcels totaling 217 ha (530 ac) were added to the Legacy Nature Preserve to address EPA’s concerns regarding the adequacy of the mitigation package proposed for Alternative D. Consequently, the size of the Legacy Nature Preserve approved by the lead agencies for construction of Alternative D totaled 849 ha (2,098 ac) and included 315 ha (778 ac) of wetland habitat. This mitigation package, which is shown in Figure 4.12-2 and Figure 2 of Appendix F, is also proposed for Alternative E, despite the fact that Alternative E would result in less direct and indirect wetland impacts than Alternative D (see Section 4.12.3, *Environmental Consequences and Mitigation Measures*). Properties associated with the Legacy Nature Preserve would be acquired by the state in fee simple title, deed restricted, and managed in perpetuity according to a management plan coordinated with the resource agencies and other interests.

Restoration and Enhancement

Wetland restoration and enhancement in the Legacy Nature Preserve was proposed in the Final EIS as a viable mitigation method that could be used to offset impacts on wetland resources due to the historical alteration and degradation of wetlands in the study area, including past alterations of wetland hydrology. Since publication of the Final EIS, a number of restoration and enhancement activities have occurred in the Legacy Nature Preserve. Implementation of each of these measures will be subject to the terms of the revised Section 404 permit and the conceptual mitigation plan approved by the Corps pursuant to that permit. Specific restoration and enhancement actions taken in the Legacy Nature Preserve to date are presented below.

- **Restoration of Wetland Hydrology.** Wetland hydrology within the Preserve has historically been altered by farming, draining, flood irrigation, and water development practices. Since publication of the Final EIS, several measures have been implemented to restore wetland hydrology in the Preserve. Roads not required for maintenance have been removed and contoured to match the adjacent land. Most removed roads in the Preserve are minor roads, and removing them has restored local hydrology by removing a barrier to overland water flow. Ditches, which were functioning as storm drainage conduits and effectively lowering the adjacent water table, have been filled and contoured to match the adjacent land. This action will stop draining of adjacent lands and raise the water table in the area. In addition, one tile drain within the southern portion of the Preserve was identified and plugged in order to raise the water table.

- **Restoration of Habitat Structure.** Several areas of wetland habitat structure within the Preserve have been restored as a result of restricting traditional grazing practices; removal of trash, debris, illegal fill, and structures; and relocation of utility infrastructure. The removal of trash and debris from one area within the Preserve has resulted in the reestablishment of wetland hydrology and the subsequent physical restoration of approximately 3 ha (8 ac) of wetlands. The wetland functional capacity resulting from the physical restoration of these of wetlands has not been determined and is not included in the total mitigation FCU calculations described below.

- **Reestablishment of Historic Hydrologic Connections.** Old channels and sloughs of the Jordan River within the Preserve were historically partially filled and/or cut off from the main stem by levees, thereby preventing the Jordan River from flowing into its floodplain. The net effect during the last 100 years was a gradual drying of the floodplain, less inundation of wetland areas, and species shifts in vegetative communities resulting from disturbance by livestock and farming activities. Restoration of this historic hydrology is being completed through reconstruction of historic channels to near natural states, returning water flows into the sloughs, providing a water delivery system into the floodplain, and controlling where the water pools and flows to restore and maintain fresh, brackish, and saline wetland habitats.

  Achieving the maximum benefits for the wildlife function of the Jordan River floodplain wetlands requires the ability to provide optimum timing, depths, and duration of delivery to the wetlands. Accordingly, an active water management plan, which includes utilization of a water delivery system (i.e., an inlet diversion, overflow weirs, and water control structures), has been developed for the 121 ha (300 ac) Jordan River floodplain within the Preserve. The water delivery system will be used to provide periods of flooding, timely draw-downs, and drying.

- **Acquisition of Water Rights.** To facilitate restoration of Jordan River floodplain hydrology within the Preserve, UDOT has purchased the water rights to 1,400 acre-feet (af) of water from the South Davis detention basin, which is fed by water from North Canyon Creek and South Davis storm drainage. This water will provide flows of up to 6 cubic feet per second (cfs) from April through October. UDOT is seeking to obtain an additional 20 cfs from the South Davis Detention Basin, which would be available year-round. Twelve additional shares (about 48 af) of North Point Consolidated Company water rights have also been purchased.

- **Removal and Control of Noxious and Invasive Plants.** Large stands of noxious species of weeds have invaded the Great Salt Lake region, degrading the habitat support functions of the wetlands and uplands surrounding Great Salt Lake. These species are typically introduced species that were not historically part of the landscape, but that are capable of spreading and taking over areas in relatively short periods of time, pushing out other, more desirable native species. Southern Davis County, including the area that would encompass the Legacy Nature Preserve, has large areas of largely uncontrolled and spreading noxious weeds—including poison hemlock (*Conium maculatum*) and perennial pepperweed (*Lepidium latifolium*)—that are invading wetland habitats. Although not as widespread, purple loosestrife (*Lythrum salicaria*) can increasingly be found along the Jordan River and drainage ditches. Other species more typical of upland habitats may also form dense stands along wetland margins, including Scotch thistle (*Onopordum acanthium*), musk thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), white top (*Caradaria draba*), and field bindweed (*Convolvulus arvensis*).

  As part of the proposed mitigation plan (Appendix F) for the Preserve, UDOT has developed and will implement a noxious and/or invasive plant control plan. The noxious and/or invasive plant control plan includes inventory, initial eradication, and ongoing control of identified target species. To date, UDOT has used goats in an attempt to eradicate noxious and invasive species in portions of the Preserve; ongoing monitoring will be used to determine if this experimental, adaptive approach is effective and should be applied more broadly to the mitigation area.

Creation

After evaluating the mitigation contained in the ROD of the 2000 Final EIS, the Corps added a condition to the project 404 permit requiring that UDOT create slope wetlands by drilling a minimum of two groundwater wells. Under the revised permit, therefore, two artesian wells would be drilled in the Legacy Nature Preserve to create the wetland hydrology necessary to support wetland habitat. Approximately 4.9 ha (12 ac) of groundwater slope wetlands would be created within the Preserve. The 4.9 ha (12 ac) of created wetlands are not included in the Table D-11 because the level of wetland function has not been determined.

Monitoring

The Section 404 permit for Alternative D (Final EIS Preferred Alternative) requires that existing playa, wet meadow, and marsh be quantified within the Legacy Nature Preserve, with the goal of retaining the relative percentages of these diverse habitats to within 25 percent of the baseline percentages. Five years of baseline vegetation and wildlife monitoring have been completed; monitoring will continue to verify that these goals are being met and to determine vegetation and wildlife responses to management. An adaptive approach will be incorporated to increase productivity of wildlife.

Adequacy of the Wetland Mitigation Package

Table 4.12-6 provides a comparison of the wetland acreage and functional capacity units that would be lost under Alternative E relative to the wetland acreage and functions that would be gained at the Legacy Nature Preserve. A more detailed comparison by wetland cover type is presented in Appendix D, *Wetlands Functional Assessment*, and Appendix E, *Analysis of the Adequacy of Wetlands and Wildlife Mitigation.* Appendix E provides an accounting of impacts relative to mitigation in a variety of formats, including functional capacity units, vegetation cover type, and wildlife habitat.

Table 4.12-6 Alternative E Wetland Impacts (Lost) and Wetlands Provided (Gained) at the Legacy Nature Preserve

	Lost (Gained) [1]					
Wetland Class	Acreage [2]	Function 1[3]	Function 2 [3]	Function 3 [3]	Function 4 [3]	Function 5 [3]
Lacustrine Fringe	318 (481)	67 (105)	45 (105)	46 (132)	40 (249)	47 (174)
Depressional	222 (157)	53 (32)	53 (33)	56 (43)	32 (69)	51 (59)
Slope (Without Created Wetlands)	169 (141)	30 (23)	30 (24)	24 (41)	27 (36)	32 (35)
Slope (With Created Wetlands)[4]	169 (153)	30 (35)	30 (36)	24 (53)	27 (48)	32 (47)

Notes:

[1] Figures representing acres and/or functional capacity units (FCUs) *lost* are based on direct and indirect impacts associated with Alternative E (Final Supplemental EIS Preferred Alternative). Figures representing acres and/or FCUs *gained* are based on the proposed acreage and configuration of the Legacy Nature Preserve (Figure 4.12-2).

[2] Acreage impact numbers are based on the 312-ft right-of-way width.

[3] FCU impact numbers are based on the 328-ft right-of-way width because the HGM model was not re-run for the narrower right-of-way width associated with Alternative E. Consequently, these numbers overstate the amount of FCUs that would be directly and indirectly affected by Alternative E.

[4] Creation of 12 ac of slope wetlands in the Legacy Nature Preserve would add up to 12 FCUs of mitigation credits to each wetland function.

In summary, the wetland acreage mitigation-to-impact ratio for Alternative E is 6.8:1, that is, the Legacy Nature Preserve would provide 6.8 acres of wetland habitat for each acre of wetland habitat directly affected under Alternative E. By wetland class, the ratio is 2.8:1 for depressional wetlands, 7.4:1 for groundwater slope wetlands, and 12.6:1 for lacustrine fringe wetlands.

For wetland functions, Table 4.12-6 illustrates that there would be a net gain for all five wetland functions within the lacustrine fringe wetland class, a net loss in functions 1, 2, and 3 for the depressional wetland class (net gain in functions 4 and 5), and a net loss in functions 1 and 2 for the groundwater slope wetland class (net gain in functions 3, 4, and 5). Creation of 12 ac of groundwater slope wetlands would result in a net gain in all wetland functions in that wetland class (See Table 4.12-6). In addition, some of the wetland functions lost in the depressional wetland class (i.e., those functions mitigated at less than a 1:1 mitigation-to-impact ratio) would be compensated by mitigating at higher ratios in the lacustrine fringe wetland class. Using a different wetland class to compensate for the loss of another type is considered out-of-kind mitigation. Federal wetlands mitigation guidelines generally require in-kind replacement of wetland habitat when the affected resource is of local importance. Although mitigation for the Legacy Parkway would be carried out on site (the Legacy Nature Preserve is contiguous with or adjacent to the Alternative E alignment), only part of the mitigation would be in kind. Mitigating all the wetlands in kind is not feasible because wetland types and functions are not uniform across the study area. The Legacy Nature Preserve is located on the west side of the study area and consists primarily of lacustrine fringe wetlands, whereas Alternative E would primarily affect wetlands along the east side of the study area, most of which are depressional and groundwater slope wetlands. In addition, not all wetland functions would respond to the proposed restoration and enhancement activities to the same degree. For example, wildlife habitat functions would gain substantially more from the restoration measures than would wetland hydrology or water quality functions.

Federal guidelines allow out-of-kind mitigation when the environmental benefit it provides is greater than that provided by in-kind mitigation. For example, the Preserve under-mitigates wet meadows in the depressional class but, as shown in Appendix D (tables D-11 and D-12), over-mitigates playa across all functions and wetland classes. Playa wetlands are uncommon compared to marsh or meadow wetlands, and preserving and restoring playa wetlands provides greater benefit than preserving and restoring marsh or meadow wetlands. The trade-off between meadow wetlands for playa could be acceptable because playas are important and unique. Because the wildlife habitat function of Great Salt Lake and its wetland ecosystem is highly valued, restoring wildlife habitat functions provides greater benefit than restoring hydrology or water quality functions, which may already be functioning at high levels. Moreover, many of the wetlands classified as lacustrine fringe wetlands function as depressional wetlands except when lake levels are very high. Because they are not frequently inundated and therefore are dependant on precipitation, their hydrology and the vegetation cover are similar to depressional wetlands. Therefore, viewing the mitigation as out-of-kind may be overstating the differences between the two wetland classes. See subsection *Summary Comparison of Wetland Impacts to Mitigation* in Section 2.1.3 of Appendix E for detailed discussion of how lacustrine fringe wetlands function as depressional wetlands.

Inundation Effects on the Legacy Nature Preserve

The study area is subject to natural cyclic inundation from changes in the water level of Great Salt Lake (see Section 4.12.2.3, *Wetlands and Great Salt Lake Flooding*). This natural fluctuation in lake level has helped to create and maintain the valuable Great Salt Lake ecosystem, such that the type and quantity of wetlands and wildlife habitat available in the study area depend on the prevailing level of the lake. A discussion of wildlife habitat changes due to rising lake levels is presented in Chapter 4.13, *Wildlife* (see Section 4.13.3.2), and frequency of historic inundation is discussed in Appendix E (Table 3-1). The following discussion focuses on wetlands and wetland functions.

Table 4.12-7 and Figures 4A and 4B in Appendix E illustrate the effects that changes in the level of Great Salt Lake have on mitigation credits in the Legacy Nature Preserve, based on elevation contours determined from aerial photography done in 2004. Specifically, these tables present the amount of FCUs by wetland class available within the Legacy Nature Preserve under three different inundation scenarios. These calculations represent the mitigation credits generated by restoration and preservation that would be lost when the lake rises, after the highway has been built, if certain areas (i.e., areas attributed to specific elevation contours) were inundated. These tables do not predict how wetlands would function after inundation (i.e., function associated with open water habitat); instead, it has been assumed that the existing wetland functions would simply cease.

The FCU values shown in Table 4.12-7 represent “snapshots in time” rather than permanent changes in wetland functions. The greatest FCU changes are for extremely rare events. For example, although the tables show substantial loss of wetland functions when areas higher than 4,212 feet above sea level are inundated, the lake level has not historically been recorded above that elevation.

Table 4.12-7 Functional Capacity Unit Credits Affected by Inundation at Various Great Salt Lake Levels on the Legacy Nature Preserve[3]

Wetland Class	Total FCUs	Contour Level to 4,212 ft		Contour Level to 4,216 ft		Contour Level to 4,220 ft	
		FCU[1]	%[2]	FCU[1]	%[2]	FCU[1]	%[2]
Function 1—Wetland Hydrology and Maintenance							
Lacustrine Fringe	105.5	9.7	90.8	0	100	0	100
Depressional	32.0	30.6	4.3	22.7	29.1	0.4	98.8
Slope[3]	22.8	19.4	14.9	8.8	61.4	0.5	97.8
Function 2—Dissolved Elements and Compounds Removal							
Lacustrine Fringe	104.8	5.5	94.8	0	100	0	100
Depressional	33.1	30.3	8.5	16.8	49.2	0.3	99.1
Slope[3]	24.2	20.4	15.7	9.4	61.2	0.5	97.9
Function 3—Particulate Retention							
Lacustrine Fringe	132.8	11.4	91.4	0.1	99.9	0	100
Depressional	43.0	41.3	4.0	24.7	42.6	0.4	99.1
Slope[3]	40.8	35.2	13.7	17.7	56.6	1.1	97.3
Function 4—Habitat Structure							
Lacustrine Fringe	249.5	25.1	89.9	0.4	99.8	0	100
Depressional	69.6	65.6	5.7	35.9	48.4	1.0	98.6
Slope[3]	36.1	31.1	13.8	15.5	57.1	1.0	97.2
Function 5—Habitat Connectivity, Fragmentation, and Patchiness							
Lacustrine Fringe	174.0	13.3	92.4	0.2	99.9	0	100
Depressional	59.1	56.4	4.6	33.3	43.6	0.7	98.8
Slope[3]	35.2	30.1	14.5	14.3	59.4	0.8	97.7

Notes:

[1] *FCU* represents the FCU credits available on Legacy Nature Preserve land at each lake level.

[2] *%* represents the percentage of FCU credits affected by inundation at each lake level.

[3] FCUs do not include the 12 ac of groundwater slope wetlands that would be created because their location on the Preserve has not been determined.